Methods of movement analysis for computer workers to decrease musculoskeletal disorders: short review

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INTRODUCTION

Work-related Musculoskeletal Disorders (WMSD) are considered the third main reason for disability and early retirement in the U.S [1]. Computer use has been associated with musculoskeletal disorders of the upper extremity (MSD-UE) with an incidence rate of 58 cases/100 person years [2] .Musculoskeletal discomfort such as stiffness or pain in the neck, back, shoulder and wrist are common among computer users [3]. They suffering from MSD during the last 12 months reported problem in the low-back pain (40.4%), upper back (39.5), Neck (38.6%), hand/wrist (36.8%) and shoulder (15.2%) [4]. For prevention of WMSDs, assessing movement is very important to determine what factors can be changed. Research on human action recognition is receiving growing attention in a wide variety of disciplines [5]. Applications of 2-D and 3-D biomechanical models to estimate compressive force on the low back, the strength requirements of jobs, application of guidelines and application of strain index and threshold limit value to address distal upper extremity musculoskeletal disorders were analyzed [6]. In this context, this literature review aimed to systematize some of the existing knowledge regarding using different applications for computer users. For this purpose, the sensor and video base methods for movement analysis were compared and the results have been analyzed from a methodological and a practical perspective for identifying the best method for computer workers' movement assessment.

METHODOLOGY

Computer work is here defined as work with video display units (VDU) or video display terminals (VDT) that involves the use of keyboard and/or mouse. This systematic review was designed in order to non-gait-related and non-invasive body movement analysis tools to try to determine the best of them for movement analysis in computer users. A systematic review of the literature were performed, searching all papers published until 2017 January 30th, with body movement analysis assessed by sensor based systems, excluding those related to gait, clinical purpose , rehabilitation and sport. The research was performed on five databases and scientific journals between 2000 and 2017. Appropriate key-words were used in Title, Abstract or Keywords. The search was limited to English language items. Only scientific journals were considered.

RESULTS

Querying the databases resulted respectively in 3960 papers before exclusion criteria. Additionally 23 records were identified through other sources. The search result after application of the exclusion and eligibility criteria is 12 articles.

DISCUSSION AND CONCLUSIONS

The sensors allow a real-time ergonomic assessment of manual tasks [7], evaluation of human body motion [8]; assessment of risk for biomechanical load [1]. The use of markerless video could lower the instrumentation barrier and make routine analysis of upper limb work-related occupational hazards more accessible to general industry [9]. Assessing posture at work with

Kinect™ sensor is also used [10]. The pressure on the seat and back rest were analyzed by sensors and video [11].

A review of different approaches for human movement was done and, it was noted that the simultaneous utilization of the different methods allows achieving better human movement analysis, compared to situations when each one of them was used individually.

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